

Observations of Comets, Perrine, 1896 Nov. 2, and Perrine, 1896 Dec. 8, at the Radcliffe Observatory, Oxford.

(Communicated by E. J. Stone, Esq., M.A., F.R.S., Radcliffe Observer.)

The following comet observations were made with the 10-inch Barclay Equatorial, using the ring micrometer, with power 100 :—

Comet Perrine 1896 Nov. 2.

Date.	G.M.T.			Local Sidereal Time.			Observer.	Comet minus Star R.A. (corrected for refraction only).			No. of Comps.			Apparent R.A. of Comet.			Parallax in R.A. p.	Log. (p × Δ).	Apparent N.P.D. of Comet.			Parallax in N.P.D. q.	Log. (q × Δ).	Ref.
	h	m	s	h	m	s		m	s	'	"	h	m	s	°	'			"					
1896. Nov. 6	7	39	52	22	40	52	W.	+0	18.98	+1	3.9	9	20	15	30.60	+0.15	9.3690	67	45	53.6	3.0	0.6740	(a)	
9	7	22	38	22	35	25	W.	-1	37.41	+0	13.1	4	20	11	7.45	+0.14	9.3592	70	5	36.0	3.1	0.6975	(b)	
9	7	22	38	22	35	25	W.	-2	17.03	+6	1.2	4	20	11	7.50	+0.14	9.3592	70	5	36.6	3.1	0.6975	(c)	
26	7	46	6	0	5	59	R.	...	...	-0	32.5	7	...	...	...	...	...	81	8	56.4	3.6	0.8085	(d)	
26	7	47	42	0	7	35	R.	-0	4.25	...	...	7	19	55	39.65	+0.18	9.5173	...	...	...	...	...	(d)	
30	7	1	1	23	36	33	W.	-1	13.17	-5	19.6	4	19	53	43.50	+0.17	9.4825	83	15	1.5	3.5	0.8125	(e)	
30	7	1	1	23	36	33	W.	-2	36.81	-5	11.9	4	19	53	43.57	+0.17	9.4825	83	14	58.4	3.5	0.8125	(f)	
Dec. 7	6	24	46	23	27	48	R.	-0	43.96	-2	17.6	6	19	51	17.81	+0.16	9.4719	86	34	36.6	3.5	0.8261	(g)	

Comet Perrine 1896 Dec. 8.

Dec. 11	8	41	21	2	0	31	W.	-1	55.96	-0	47.6	3	1	10	19.25	+0.24	8.9013	84	38	33.1	18.8	0.8044 (h)
12	8	14	2	1	37	4	R.	-0	45.31	+0	52.4	8	1	17	16.32	+0.09	8.4986	85	2	24.5	18.7	0.8066 (i)
1897. Jan. 23	8	54	35	5	3	19	R.	-1	35.92	-0	11.7	6	4	44	52.53	+0.05	8.4704	90	20	21.9	12.5	0.8411 (j)
26	8	14	55	4	35	23	R.	+0	25.24	-0	31.0	12	4	53	47.69	-0.05	8.4698	90	6	46.6	11.8	0.8398 (k)

Observers' Remarks.

- (a) Observations very difficult owing to the extreme faintness of the object. Instrument white with hoar frost at end of observations, object-glass thinly covered with moisture. Sky hazy.
- (b), (c) Sky very hazy. A small and very faint cluster of three or more stars is near, which in the fog resembles the Comet.
- (d) Comet fairly bright with a nucleus of about the 12th magnitude. The comparison star is inconveniently close to the Comet for ring-micrometer work. Observed in breaks of rapidly passing clouds. Wind squally.
- (e) (f) Comet is brighter than at my last observation; and, I believe, has a tail, widely fan-shaped, extending northward, but much fainter than coma. Foggy to-night in S.W.
- (g) Nucleus 12 magnitude. Coma  $1\frac{1}{2}'$  diameter.
- (h) Observations unsatisfactory. Instrument dripping with moisture; wiped object-glass twice, but it was rapidly coated again with condensation. Comet is about  $9\frac{1}{2}$  or 10 magnitude; but there is much moonlight.
- (i) Moonlight strong; centre of a very faint nebulous condensation observed.
- (j) Comet is a rather faint, nebulous mass,  $2'$  in diameter, with a condensation.
- (k) Comet is a faint nebulosity of  $2'$  diameter, with a condensation. Observations rather difficult.

Assumed Places of the Comparison Stars.

Ref.	Mean R.A.			Reduction to Apparent R.A. s	Mean N.P.D.	Reduction to Apparent N.P.D. "	Authority.
	h	m	s				
(a)	20	15	9.33	+2.29	67 45 7.9	-18.3	Berlin B., A.G. 7639
(b)	20	12	42.57	+2.29	70 5 40.1	-17.2	Berlin A., A.G. 8079
(c)	20	13	22.24	+2.29	69 59 52.7	-17.3	Berlin A., A.G. 8087
(d)	19	55	41.57	+2.33	81 9 39.7	-10.8	Barclay Equatorial comparisons with Schjellerup, 7741, Lamont, 22619; Lamont, 22819; Glasgow (1870), 5000

Ref.	Mean R.A. h m s	Reduction to Apparent R.A. s	Mean N.P.D. ° ' "	Reduction to Apparent N.P.D. "	Authority.
(e)	19 54 54.31	+2.36	83 20 30.8	-9.7	Bonn vol. vi. +6° 4393
(f)	19 56 18.02	+2.36	83 20 20.1	-9.8	Bonn vol. vi. +6° 4401
(g)	19 51 59.37	+2.40	86 37 2.1	-7.9	Barelay Equatorial comparisons with Albany, 6936
(h)	1 12 11.01	+4.20	84 39 47.9	-27.2	Albany A.G., 353
(i)	1 17 57.41	+4.22	85 1 59.0	-26.9	Radcliffe Transit-circle observation, 1896 Dec. 15
(j)	4 46 26.61	+1.84	90 20 37.0	-3.4	Radcliffe Transit-circle observations, 1897 Feb. 17, 20
(k)	4 53 20.60	+1.85	90 7 20.7	-3.1	Radcliffe Transit-circle observations, 1897 Feb. 17, 20

In the computation of the parallaxes the adopted value of the Sun's mean horizontal parallax is 8".85; and the geocentric distances,  $\Delta$ , are taken from the *Astronomische Nachrichten*, as follows :—(a), (b), (c), No. 3386; (d), (e), (f), (g), No. 3387; (h), (i), (j), (k), No. 3396.

Observation of Comet Perrine (1896 Dec. 8) with the Transit-Circle.

Date.	G.M.T. of Transit. h m s	Observer.	Apparent R.A. of Comet. h m s	Apparent N.P.D. of Comet. ° ' "	Parallax N.P.D. q.	Log. (q x $\Delta$ ).	Observer's Remarks
1896. Dec. 11	7 51 2	W.	1 10 3.88	84 37 49.3	18.8	0.8035	Sky very thick; moonlight and haze. Observation very difficult. The microscope readings have been increased by 1 rev. = 1'

In the computation of the parallax the adopted value of the Sun's mean horizontal parallax is 8".85; and the geocentric distance,  $\Delta$ , is taken from the *Astronomische Nachrichten*, No. 3391.

Observers : W., Mr. W. Wickham ; R., Mr. W. H. Robinson.

*Zodiacal Radiants of Fireballs.* By W. F. Denning.

I have previously pointed out that the majority of large fireballs observed *move slowly, are directed from radiants in the western half of the sky and in the neighbourhood of the horizon* (*Monthly Notices*, vol. liv. pp. 342 and 539). They appear, in fact, to form a special class of bodies, and to offer well-marked distinctions to the ordinary shower-meteors generally moving swiftly from radiants high in the eastern sky.

To what has been already said on this subject I may now add that the majority as well as the most prominent of the fireball radiants apparently cluster in a girdle conforming approximately with the position of the ecliptic. This is not an inviolable law of distribution, for many exceptions to it can be found, but it agrees with the weight of the evidence, and much of this is of a very suggestive and significant kind.

There are probably few persons who have occupied themselves in the comparison and assortment of well-marked fireball radiants, but those who have will remember the brilliant Cancerids of January, Sextantids of February  $\beta$  Leonids of March, Virginids and Librids of April, Scorpiids and Sagittarids of June, Aquilids, Capricornids and Aquarids of July and August, Piscids of September, Arietids of October, Taurids of November, and Geminids of December.

I have compiled the following table as representing approximately the facts observed :—

	R.A. Fireball Radiants.	Chief Positions.
	°	
Jan.	110 Geminids, Cancerids	{ 97 + 29 110 + 24 132 + 21
Feb.	140 Sextantids, Hydrids	{ 145 + 5 148 - 12
Mar.	170 Sextantids, $\beta$ Leonids	175 + 10
April	200 Virginids, Librids	{ 208 - 10 216 - 8
May	230 Serpentids, Scorpiids, Ophiuchids	{ 228 - 3 235 - 15 244 + 7
June	260 Scorpiids, Sagittarids	{ 250 - 20 269 - 23